



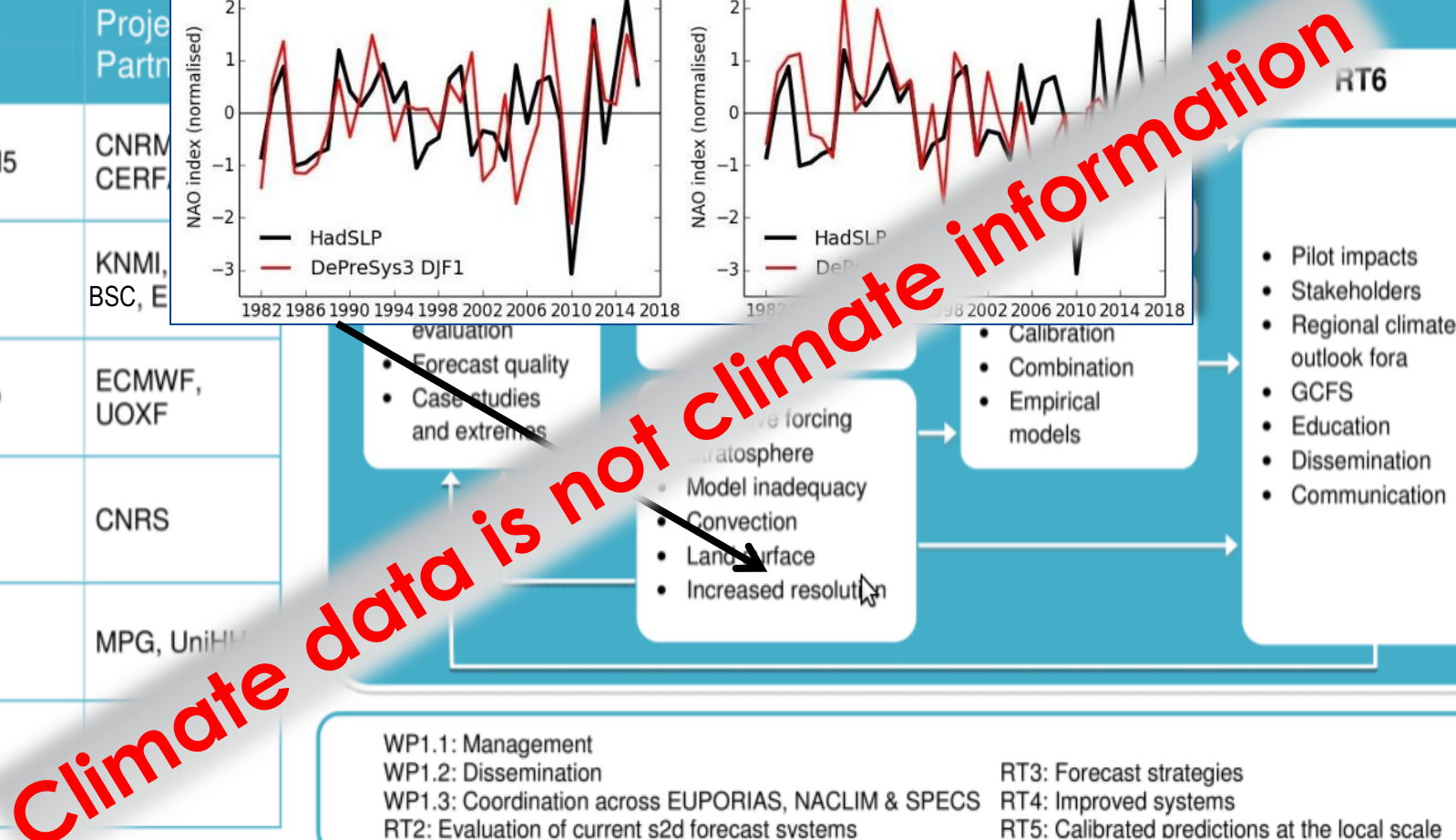
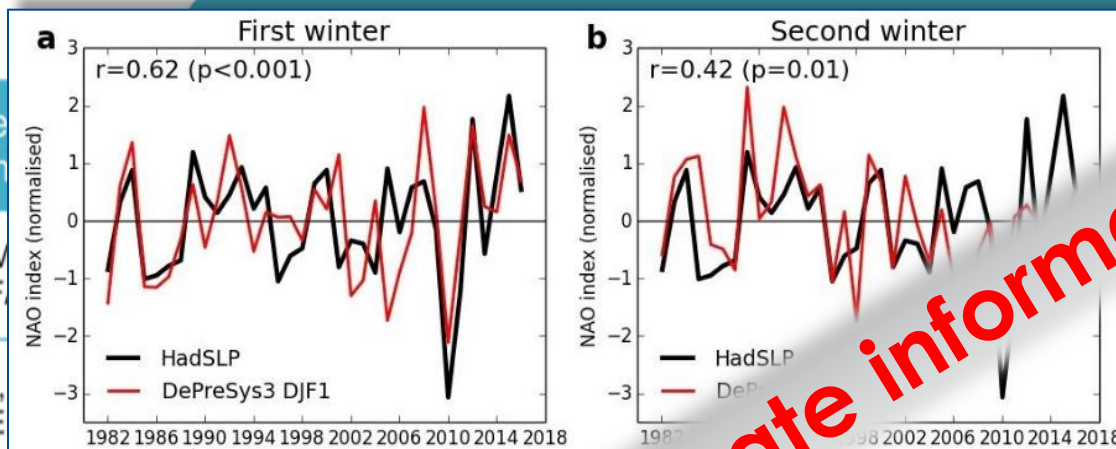
SPECS: Climate Prediction for Climate Services

Francisco J. Doblas-Reyes

SPECS objective and structure

SPECS specs-fp7.eu produced quasi-operational and actionable local climate information with a new generation of reliable European climate forecast systems.

Forecast System	Project Partners
CNRM-CM5	CNRM, CERF
EC-Earth	KNMI, BSC, E
IFS/NEMO	ECMWF, UOXF
IPSL-CM5	CNRS
MPI-ESM	MPG, UniH
UM	



Resolution brings leap forward in skill



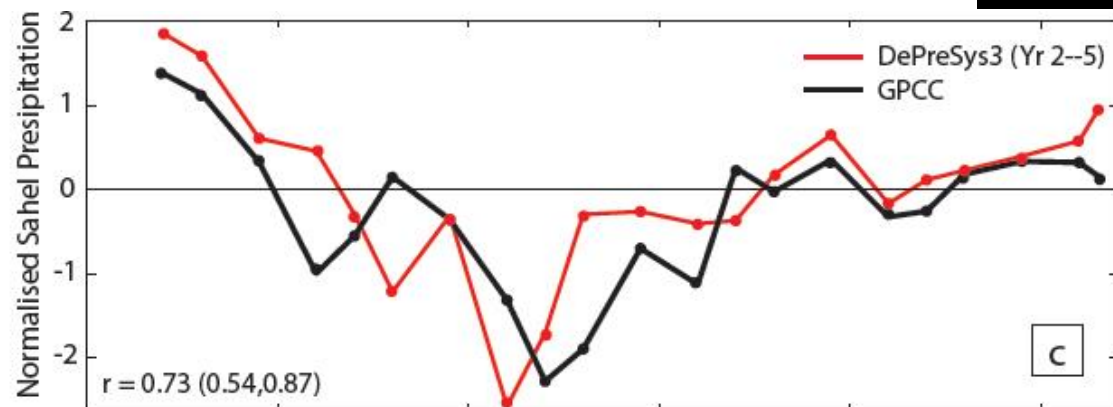
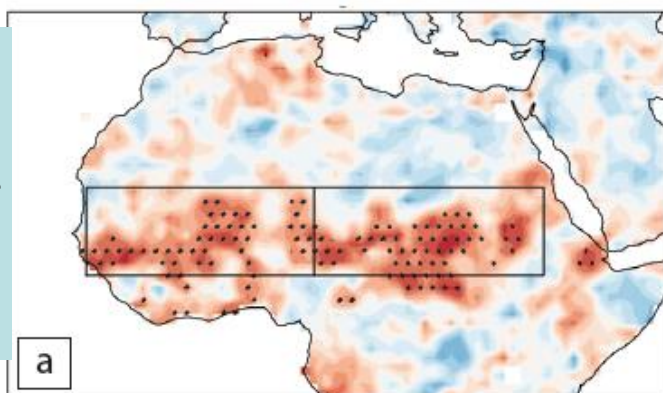
Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación



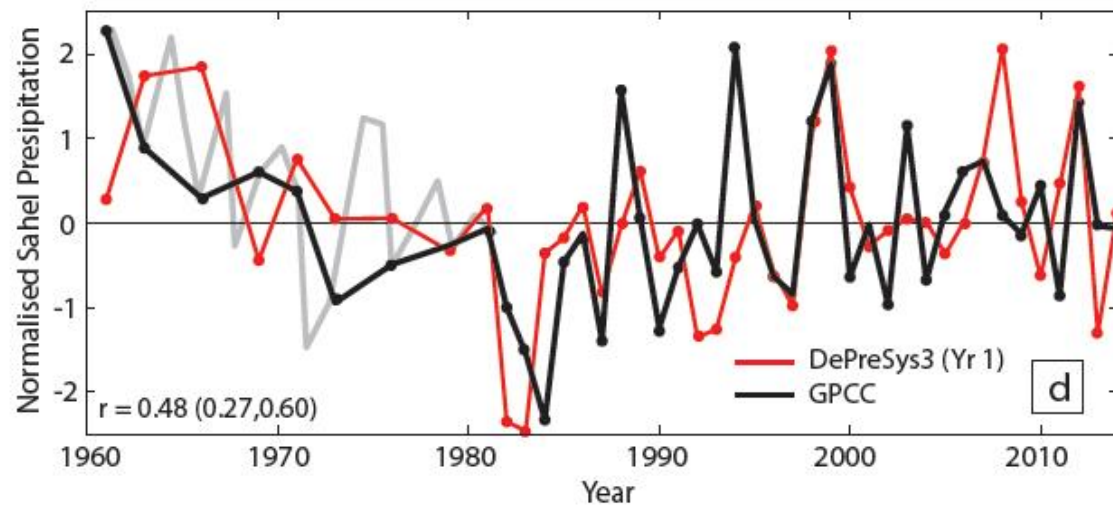
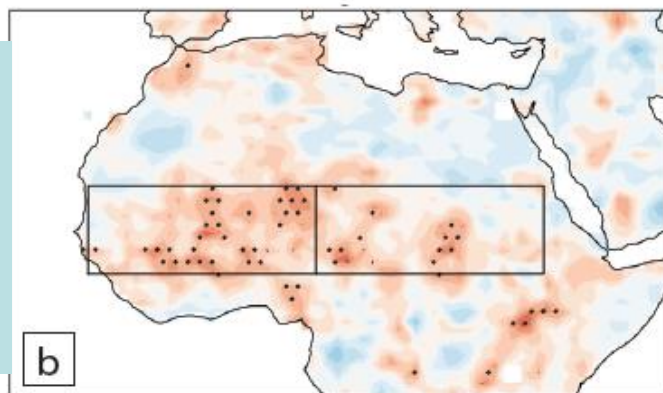
Correlation of the ensemble mean precipitation from DePreSys3 (N216-ORCA025).



Multiyear



Inter-annual



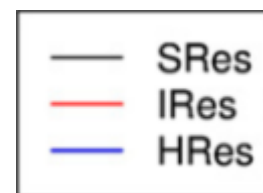
Increased resolution improves skill



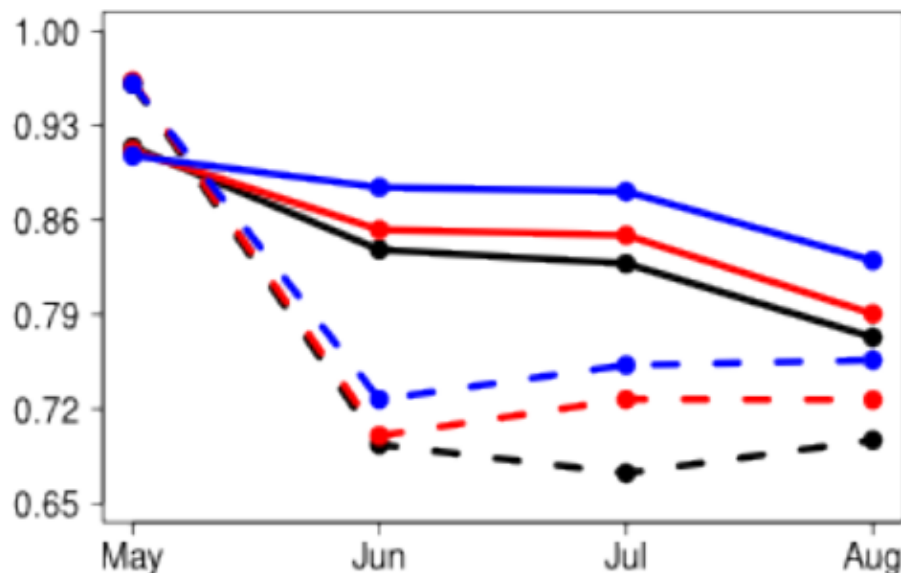
Forecast quality from EC-Earth3.1 seasonal hindcasts (1993-2009, Glorys2v1, ERAInt and ERALand initial conditions). Solid for ESA-CCI and dashed for ERSST.

Blue for high resolution ocean and atmosphere, red for high resolution ocean, black for standard resolution.

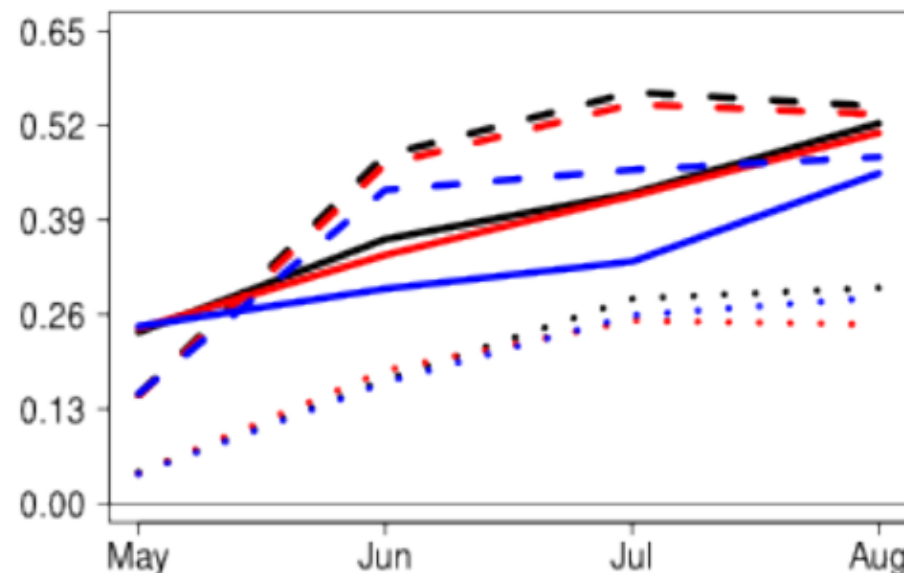
May start dates



a) Correlation



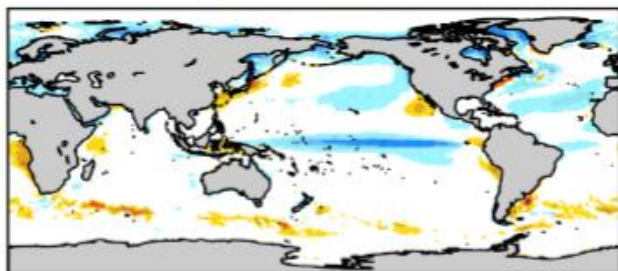
b) Spread and RMSE



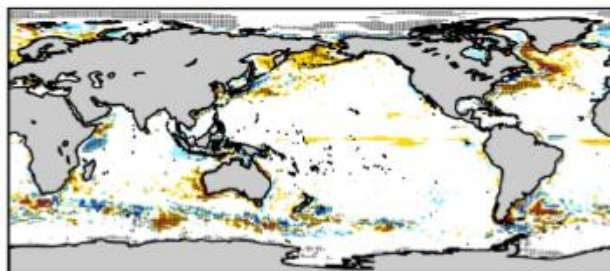
Increased resolution modifies biases

Bias from EC-Earth3.1 seasonal hindcasts (1993-2009, Glorys2v1, ERAInt and ERA-Land initial conditions).

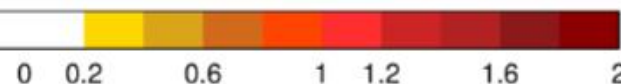
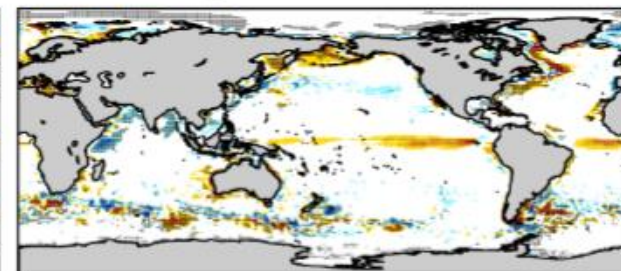
a) SRes-ESA: SST



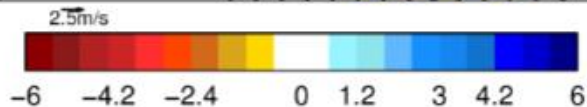
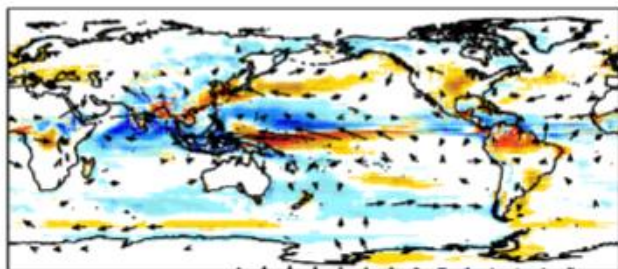
b) IRes-SRes: SST



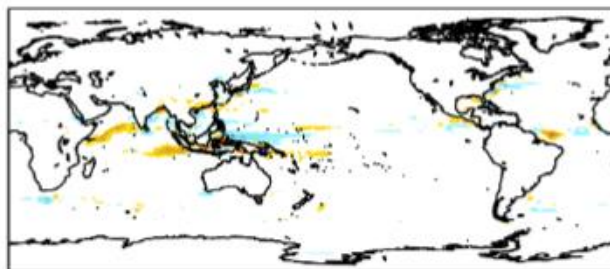
c) HRes-SRes: SST



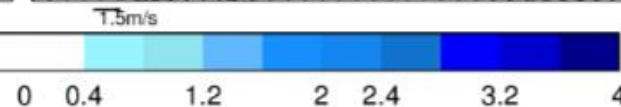
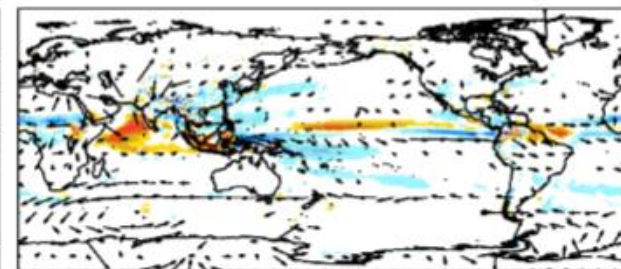
d) SRes-GPCP: Precip



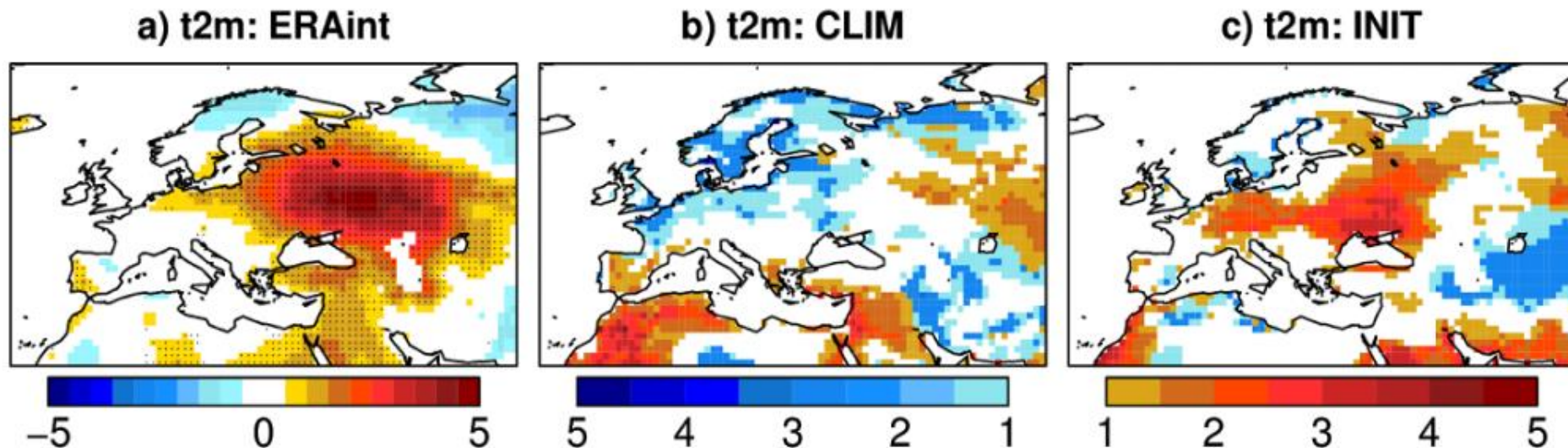
e) IRes-SRes: Precip



f) HRes-SRes: Precip

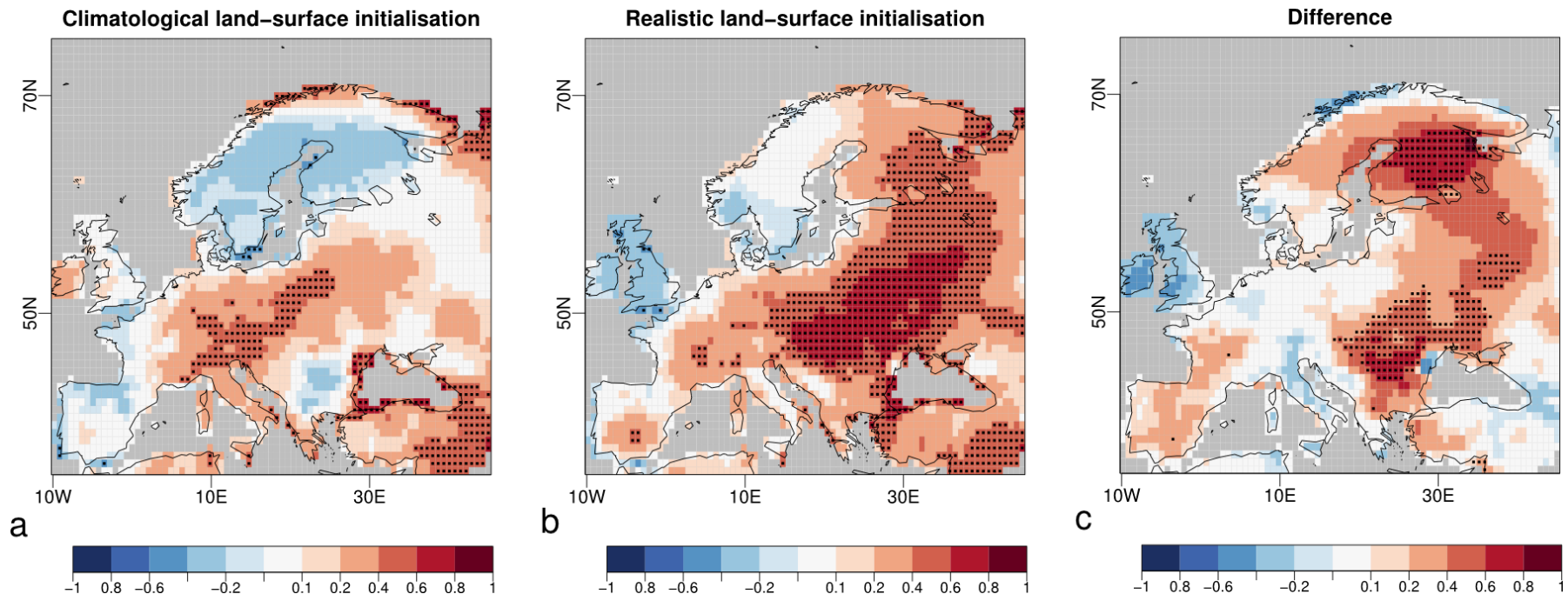


JJA near-surface temperature anomalies in 2010 from ERAInt (**left**) and odds ratio from experiments with a climatological (**centre**) and a realistic (**right**) land-surface initialisation. Results for EC-Earth2.3 started in May with initial conditions from ERAInt, ORAS4 and a sea-ice reconstruction over 1979-2010.

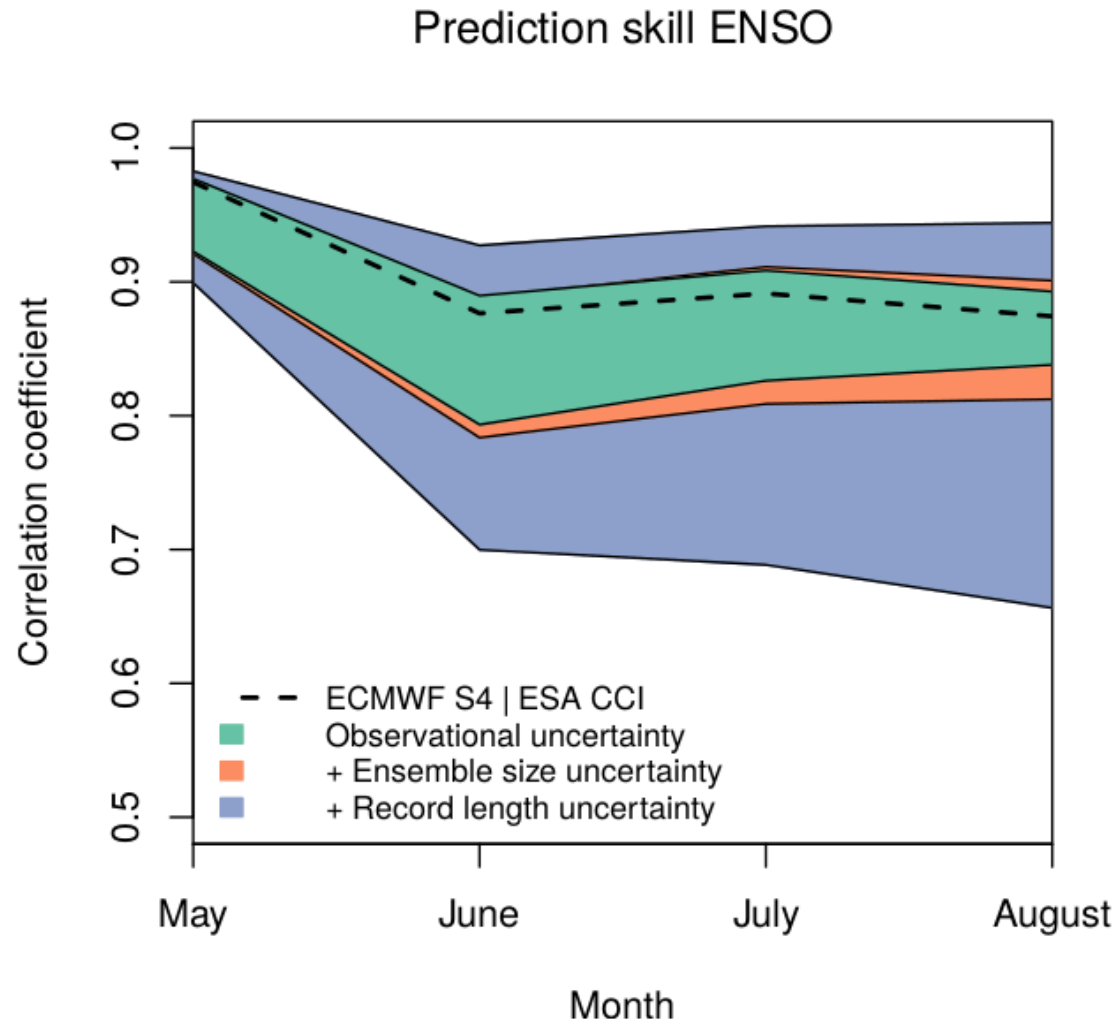


Correlation of JJA near-surface temperature from EC-Earth3.1 hindcasts started in May over 1993-2009 with climatological (**left**) and ERA-Land (**centre**) land-surface initial conditions, and their difference (**right**).

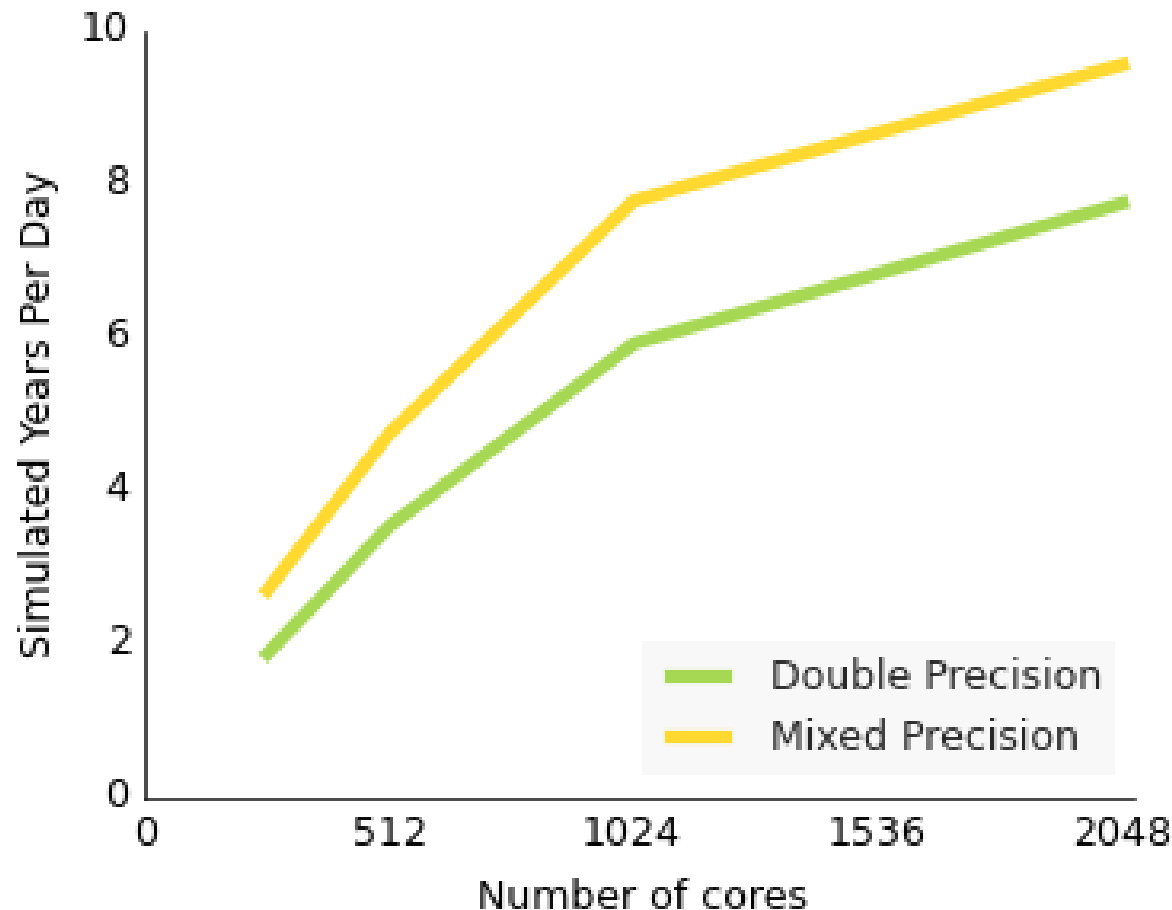
Hard to detect differences in sensitivity experiments: use of the Steiger test for correlation differences (increased power).



Niño3.4 SST correlation of the ensemble mean for ECMWF System 4 started every May over 1993-2010.

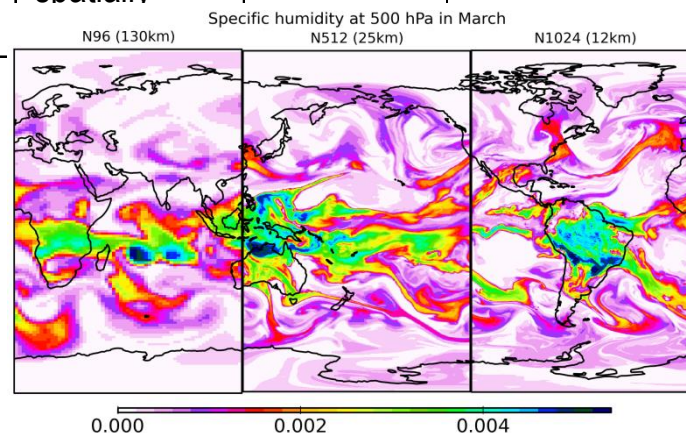


Speed up of the NEMO3.6 (ORCA025L75) code when switching some parts of the code from double to single precision.



Aims to develop advanced and well-evaluated high-resolution global climate models, capable of simulating and predicting regional climate with unprecedented fidelity (contribution to HiResMIP).

Institution	MO NCAS	KNMI BSC SMHI CNR	CERFACS	MPI	AWI	CMCC	ECMWF
Model names	MetUM NEMO	ECEarth NEMO	Arpege NEMO	ECHAM MPIOM	ECHAM FESOM	CCESM NEMO	IFS NEMO
Atmosph. Res., core	60-25km	T255-799	T127-359	T63-255	T63-255	100-25km	T319-799
Atmosph. Res., FCM	10-5km						T1279-2047
Oceanic Res., core	$\frac{1}{4}^{\circ}$	$\frac{1}{4}^{\circ}$	$\frac{1}{4}$	$0.4\text{-}\frac{1}{4}^{\circ}$	$1\text{-}\frac{1}{4}$ spatially variable	$\frac{1}{4}$	$\frac{1}{4}$
Oceanic Res., FCM	$1/12^{\circ}$	$1/12^{\circ}$	$1/12^{\circ}$	$1/10^{\circ}$	$1\text{-}1/14^{\circ}$ spatially	$(1/16^{\circ})$	



- **Progress:** increased resolution improves both mean climate and skill for some areas and variables; further improvements require substantial experimentation for the model to be diagnosed at the same level as with the standard resolution configuration.
- **Challenges:** reference uncertainty, observations at equivalent resolutions, process understanding, leveraging knowledge from other communities (climate modelling and weather forecasting), etc.
- **Technology:** make the most of a context with rapidly evolving technology (heterogeneous nodes, software, mobile data capture, visualisation, storage/compression, computing and storage outsourcing) to reduce the model cost and increase the capability to experiment with expensive configurations.
- **Services:** who benefits from these expensive efforts?